Service Manual

Rev B
Omni-Vent Series D
Ventilators

Allied
HEALTHCARE PRODUCTS INC.
GLOBAL SUPPORT OF LIFE

OMNI-TECH MEDICAL, INC.

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PURPOSE

The purpose of this manual is to provide the reader with important information concerning the general service and minor repair of the Omni-Vent Series-D ventilators.

This manual covers materials pertinent to models D-7and D-8/MRI.

If there are any questions concerning the model or type of Omni-Vent in you possession, please contact the factory.

GENERAL POLICY STATEMENT

The scope of this manual covers general maintenance, calibration of controls, disinfection procedures, and replacement of parts that may be in need of repair.

The Factory does not intend to compete with biomedical repair services, however the owner of the Omni-Vent should realize that the machine is warranted for one year from date of purchase.

TESTING

The Factory utilizes certain standards of practice, some of which are essential to understand before and after maintenance is performed on the Omni-Vent Series-D ventilators.

EQUIPMENT NEEDED FOR BENCH TESTING:

(1) Operators manual

(2) Regulated, pressurized gas source of medical grade oxygen or air.

(3) Knowledge of the usual gas pressure source in the environment where the machine will generally be used.

(4) Test lung capable of measuring volume, flow and rate per minute, or, a hand held spirometer, simple rubber test lung and watch with a second hand.

(5) Patient tubing circuit; either the disposable unit specifically designed for the Omni-Vent or a circuit utilizing only the Bird #2575 series exhalation valve.

ROUTINE TEST

(1) With the source gas pressure set at 50 psi (or the normal pressure encountered) and the on/off switch in the off position:

a. Turn the Flow Rate Control to the full-open position by turning it fully counter-clockwise until resistance is encountered.

b. Next, push in on the outer portion of the Tidal Volume Control knob and hold it fully depressed; then turn the inner portion of the knob fully clock-wise until resistance is felt, then turn it counter-clockwise to the one liter position as indicated by the white position marker on the inner knob.

c. Duplicate this action with the lower control knob assembly labeled Rate, and return the position marker to 20 breaths per minute.

(2) Turn the on/off switch to the on position and allow the ventilator to cycle several times.

(3) Attach the patient tubing circuit to the test lung and observe the readings.

Various readings can now be made by altering the tidal volume and rate controls. Precise or minute tidal volume changes can now be made by turning the Flow Rate Control until the amount of volume required is being read on the spirometer.

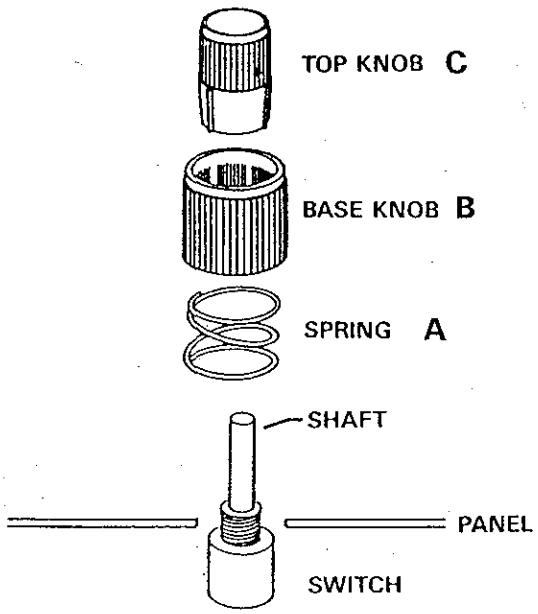
NOTE

If cylinder gas with a pressure reducing regulator is employed for this test or during clinical practice it is important to be sure that the regulator is in excellent working order, is large enough to allow proper flow per unit of time and is not employing a FLOW GAUGE (flow meter) in an attempt to power the Omni-Vent.

LOCKING KNOB

ASSEMBLY INSTRUCTIONS

1. Place coil spring (A) over shaft.
2. Place base knob (B) over spring so that spring seats in groove of base knob.
3. While holding base knob down press top knob (C) down firmly over shaft. IMPORTANT: There must be a distance of .125" to .225" between the base knob and the panel.
4. Tighten set screw on top knob with an Allen wrench.



CALIBRATION OF CONTROLS

(1) Using the set up for routine testing preceding, turn the on/off switch to the off position. The Flow Rate Control knob should be in the full open position.

(2) Remove the tidal volume and rate control knobs with a 1/16 inch allen wrench.

(3) Turn the on/off switch to the on position and allow the ventilator to cycle several times.

(4) Adjust the tidal volume and rate to one liter and 20 breaths per minute, respectively, by turning the shafts until that volume and rate are read on the testing device.

(5) Reassemble the Rate control knob assembly first by placing the spring, outer knob collar then the inner knob over the shaft. The white indicator line should be positioned to point to 20 breaths per minute. Secure with the allen screws.

(6) Repeat step 5 above with the Tidal Volume controls. The white indicator line should be positioned to point to one liter.

(7) Calibration checks can now be accomplished by turning the controls to various positions and readings made.

NOTE

From the starting point of one liter, the calibrated volume and rate markings on the front label are accurate for one full turn counter-clockwise only. If the knobs are turned farther than 360 degrees the calibrated markings are no longer valid and the only way to ensure accuracy in clinical use is with a hand held spirometer or other monitoring device.

NOTE

If inlet gas pressures vary greatly from bench testing to clinical practice, recalibration to the general working pressures is recommended. The use of a pressure reducing regulator in line for compliance of these recommendations is suggested.

REPLACEMENT OF PARTS

INLET FILTER (#25 on exploded view diagram, page 13)

It is recommended that the gas inlet filter be inspected and changed at least once per year, or more often as needed.

If the filter is not able to allow sufficient gas flow for the Omni-Vent to operate properly, the cardinal signs to look for are:

(1) Machine cycles rapidly on and off when the controls are properly set and the observer does not expect this result.

(2) Machine cycles very slowly in spite of controls indicating otherwise.

CHANGING THE FILTER

(1) Machines with the rotary on/off switch

(a) Use a 1/16 inch allen wrench to remove the screws holding the rotary knob located on the on/off switch and remove the knob.

(b) Attach a 7/8 inch wrench to the gas inlet assembly nut (#23) and hold it in position.

(c) Attach an adjustable wrench to the rotary on/off switch and turn it counter-clockwise until loose then remove completely by hand.

(d) Remove the inlet filter with a tweezer or other suitable tool.

(e) Replace the filter and reverse steps (a) through (c) above.

RETESTING

After the filter has been inspected or replaced, retest the machine using the Routine Testing Procedure on page 2.

PRESSURE GAUGE (MANOMETER)

Replacement of the pressure gauge may not be necessary with the Model D-7 series machines. These machines are identified by the beige color and the serial number plate located on the bottom of the machine. The pressure gauge on the Model D-7 has an adjusting screw located at the top of the gauge. Remove the lens with a counter-clockwise movement and, using a small screwdriver, attempt to "O" the needle on the gauge.

GAUGE REPLACEMENT

(1) Remove the screws holding the front panel of the machine to the body.

(2) Carefully pull the front panel away from the body.

(3) Remove the protective plastic lens of the pressure gauge with a counter-clockwise movement.

(4) Remove the holding nuts and washers from the clamp securing the pressure gauge to the inside body of the front panel.

(5) Some later models of the Omni-Vent have two screws holding the clamp to the pressure gauge, if so, remove them.

(6) Cut the tubing from the pressure gauge to the nipple on the inside of the body of the front panel at the bottom of the pressure gauge. Place the open end of the tubing on the inlet nipple of the new pressure gauge.

(7) Replace the pressure gauge. After installing, replace the plastic lens on the front panel to ensure that the pressure gauge is installed properly. Tighten screws or holding nuts securely.

(8) BEFORE REASSEMBLY OF THE FRONT PANEL TO THE BODY:

(a) Perform a ventilator test with a patient tubing circuit attached to a test lung and generate pressures suitable to make the pressure gauge function.

(b) Replace the front panel carefully to the body of the ventilator. Be certain that all tubing is not crimped as this step is accomplished. Place one or two holding screws back in place to hold the front panel to the body and perform another ventilator function check. This step will ensure that there are no crimped tubes before total reassembly.

NOTE

If reassembly of a Model D-8/MRI is taking place and the tubing is difficult to reinstall, remove the back panel screws and panel and pull the tubing back into the body from the rear.

(c) Replace the rest of the holding screws to the front panel and perform a ventilator test.

NOTE

Pressure gauges are usually broken clinically when the operator, in performing a pressure relief valve check, holds a finger over the open end of the patient tubing circuit and adjusts the ventilator to a setting suitable to cause the pressure gauge to wind itself around the center. This can be eliminated by not totally occluding the outlet port of the tubing or using a small rubber test lung.

CONTROL VALVE FOR TIDAL VOLUME OR RATE

Replacement of either or both of these valves (#51) is accomplished in the same manner.

(1) Remove the screws holding the front panel of the machine to the body.

(2) Carefully pull the front panel away from the body.

(3) Locate the acrylic block (#15) holding the control valves. Find the two 6/32 screws securing the acrylic block assembly to the front panel and remove them.

(4) Place the acrylic block on a table with the valves facing upward.

(5) Remove the valve being replaced by unscrewing the two retaining screws (#52) ensuring that the gasket is also removed.

(6) Prepare the new valve by placing the gasket on the bottom of the valve, ensuring that the gasket parts fit into the eight holes on the bottom of the valve. Smooth the gasket so that there are no ripples or gaps between the gasket and valve.

(7) Place the valve onto the acrylic block by placing the valve male guide into the female slot on the acrylic block. Line up the securing screw holes with the screws and secure same. A snug fit is enough; do not over-torque as it may flex the acrylic block.

(8) Place the acrylic block back on the aluminum spacers and insert the valves through the front panel. Secure the acrylic block with the holding screws (#44).

(9) Perform a functional test before reassembly of the front panel to the body.

(10) If the functional test is sufficient, carefully replace the front panel to the body of the ventilator, ensuring that the tubing is not crimped.

(11) Perform another functional test to ensure the machine is working properly. The valve that was replaced will need to have a locking knob assembly and be calibrated at this time. (See page 3).

CLEANING AND DISINFECTION

General surface cleaning and disinfection may be accomplished with any hospital grade disinfectant.

CAUTION Care must be taken if spray/aerosol driven products are used. Residue may accumulate under control knobs and cause them to malfunction.

GAS STERILIZATION Any of the Series-D ventilators may be gas sterilized with Ethylene Oxide (ETO) at temperatures not to exceed 55 degrees C.

Post ETO sterilization procedures call for aeration for 24 hours to include at least one full hour of cycling the ventilator with oxygen or compressed air. A functional test of the ventilator should be made to ensure proper working order before clinical use.

Specific I:E/VT/Rates Table
Maximum Rate and Volumes at 1:1 Ratios

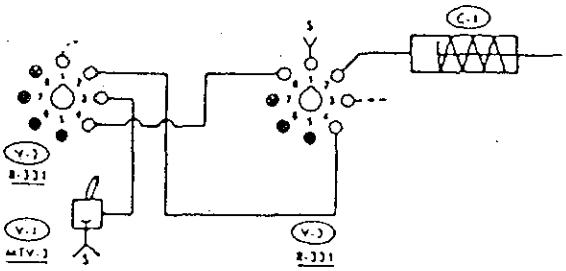
Compliance 0.5 **Resistance R5**

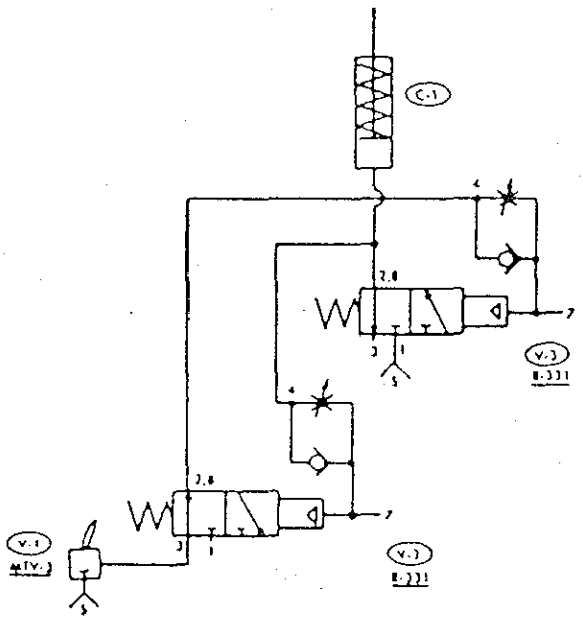
VT (L's)	f(Minute)	V (l's)
.005	150	.75
.010	150	1.5
.020	150	3.0
.030	150	4.5
.040	150	6.0
.050	150	7.5
.060	150	9.0
.070	150	10.5
.080	150	12.0
.090	150	13.5
.10	150	15.0
.20	125	25.0
.30	111	33.0
.40	88	35.0
.50	73	36.0
.60	61	36.0
.70	52	36.0
.80	48	38.0
.90	44	40.0
1.0	31	31.0
1.1	34	37.0
1.2	30	36.0
1.3	29	38.0
1.4	28	39.0
1.5	27	40.0
1.6	26	42.0
1.7	25	43.0
1.8	24	43.0
1.9	23	44.0
2.0	22	44.0

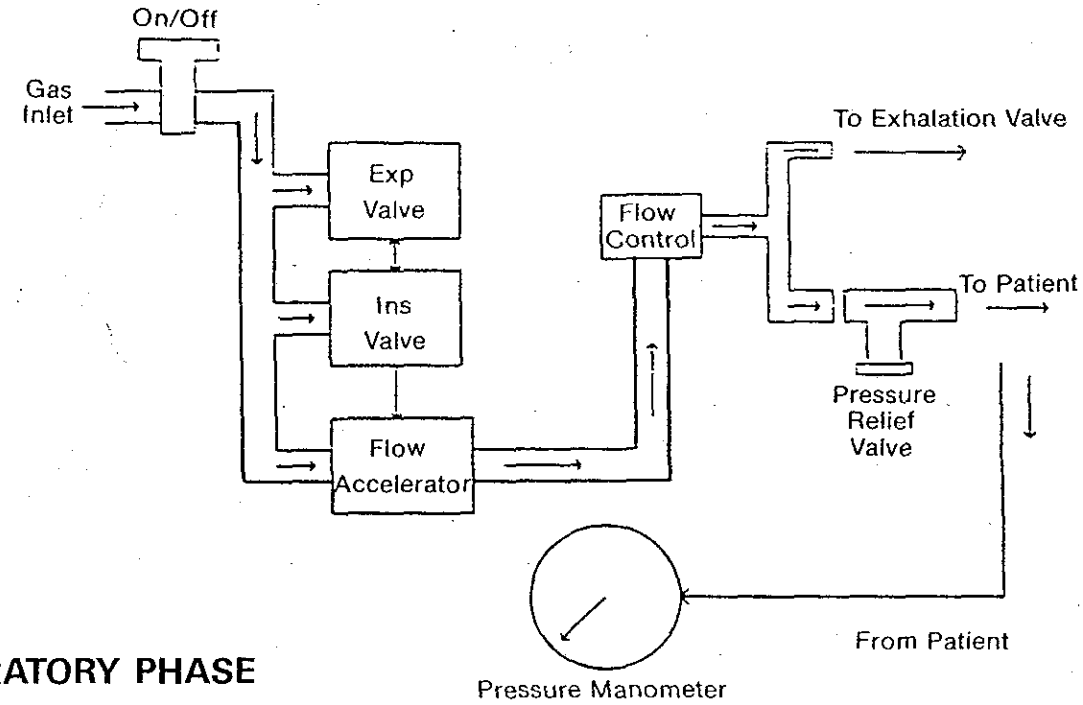
APPLICATION CIRCUIT DIAGRAM

AUTOMATIC CYCLER

Turning on the on/off switch V-1 sends a signal through V-2 and to the flow control of V-3 where it is delayed before piloting the 3-way (normally open) valve V-3. The output of V-3 also goes to the flow control of V-2 where it is delayed before piloting the 3-way (normally closed) valve (V-2). When V-2 shifts, it shuts off the original signal from V-1 and exhausts the pressure that has piloted V-3 allowing the spring to shift the valve. This action exhausts the pressure that has piloted V-2 allowing the spring to shift the valve. This allows the signal from V-1 to start the cycle all over again. The adjustment on V-3 controls the "on" duration, and the adjustment on V-2 controls the "off" duration at C-1 (patient circuit outlet port).



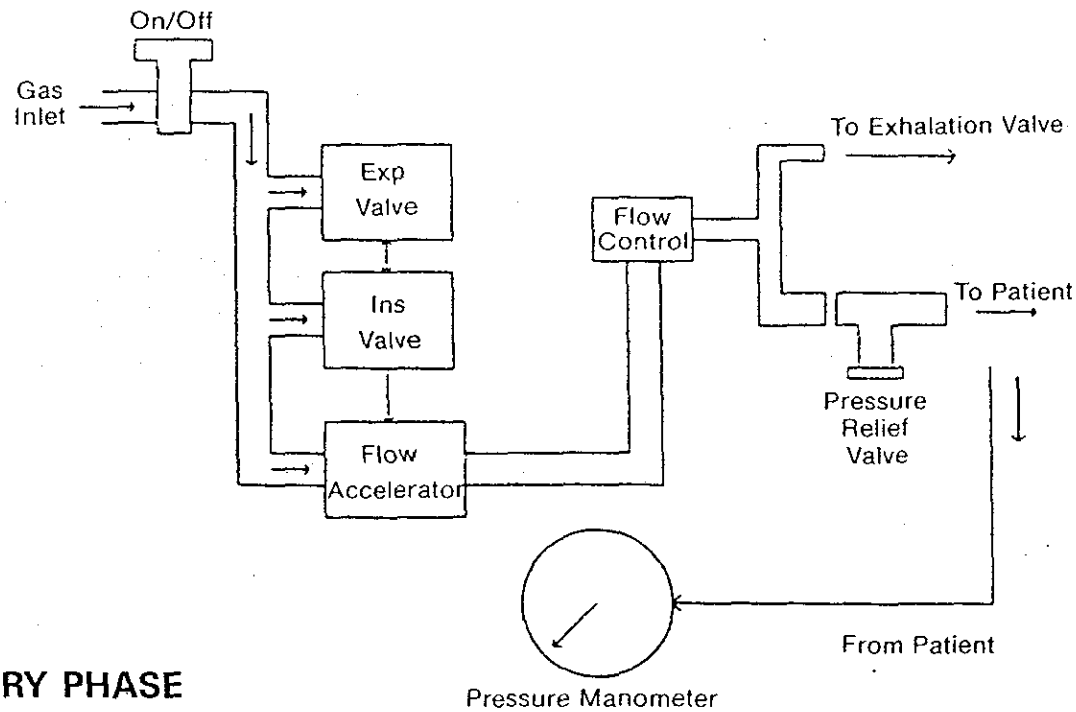




INSPIRATORY PHASE

Source gas is introduced through a filter in the gas inlet assembly; then gas flows to the pneumatic valve supply inlet. The gas flows to the flow control then to the tee assembly which directs gas simultaneously to the exhalation valve and pressure relief valve and to the patient.

As gas pressure increases in the lung, it is transmitted to the manometer through a tubing independent from the tubing wye connector.



EXPIRATORY PHASE

Source gas follows the identical path of the inspiratory phase to the pneumatic valves and is then held until the inspiratory phase begins.

OMI

OMNI-VENT SERIES D VENTILATOR

1 — KN000003 — Knob
2 — KN000001 — Locking Knob Component
3 — KN000004 — Locking Knob Spring
4 — KN000002 — Flow Control Knob
5 — SC063214 — Panel Screws (8)
6 — BX200003 — Black Front Plate
7 — MN000001 — Brass Manifold
8 — NT063200 — 6-32 Screw Nut
9 — HS000001 — Urethane Hose
10 — MM000001 — Manometer/Pressure Gauge
11 — BX200002 — Pressure Gauge Bracket
12 — NT063200 — 6-32 Screw Nut
13 — BR103218 — 10-32 x 1/8 Hose Barb
14 — HS000001 — Urethane Hose
15 — BL000001 — Acrylic Block
16 — HS000001 — Urethane Hose
17 — SC102412 — Handle Screw
18 — WS200010 — Nylon Handle Washer
19 — NT000038 — Pressure Relief Valve Lock Nut
20 — OT1017 — Pressure Relief Valve
21 — BX000003 — Handle
22 — BX000005 — Top Mounted IMV Bleed Valve
23 — ON000004 — Right Angle Hose Connector
24 — On000001 — On/Off Switch
25 — OT1018 — Brass Inlet Filter
26 — ON000004 — Brass Bulkhead Body
27 — BR180018 — 1/8 x 1/8 Hose Barb
28 — BX200004 — Back Plate
29 — SC063214 — Panel Screw (8)
30 — ON000004 — Brass Bulkhead Nut
31 — WS100010 — #10 Bronze Washer
32 — HS000001 — Urethane Hose
33 — CP103218 — 10-32 x 1/8 Coupling
34 — SC103200 — 10-32 Screw Plug
35 — BR103218 — 10-32 x 1/8 Hose Barb
36 — BX000002 — Feet
37 — NT000078 — Pressure Relief Valve Nut Cap
38 — BX000001 — Custom Box
39 — HS000001 — Urethane Hose
40 — BR103218 — 10-32 x 1/8 Hose Barb
41 — CP103218 — 10-32 x 1/8 Coupling
42 — HS000001 — Urethane Hose
43 — BR180018 — 1/8 x 1/8 Hose Barb
44 — SC063201 — 6-32 x 1 Screw
45 — FA000002 — Flow Accelerator
46 — FA000003 — Round Brass Washer
47 — FA000004 — Hex Brass Washer (2)
48 — FA000001 — Flow Accelerator
49 — BR103218 — 10-32 x 1/8 Hose Barb
50 — HS000001 — Urethane Hose
51 — BL000002 — Insp/Exp Valves
52 — BL000002 — Insp/Exp Valve Screw
53 — BL000004 — 6-32 Aluminum Standoff
54 — HS000001 — Urethane Hose
55 — BR103218 — 10-32 x 1/8 Hose Barb
56 — FC000001 — Flow Control
57 — BX200002 — Flow Control Bracket Prior to 2001
58 — FC000001 — Flow Control Nut